

SELF- MOTIVATION AS A MEDIATOR FOR TEACHERS' READINESS IN APPLYING ICT IN TEACHING AND LEARNING

Jimmi Copriady

*Faculty of education, University of Riau, Indonesia
jimmiputra30@gmail.com*

ABSTRACT

The aim of this study is to examine teachers' motivation as a great mediator for teachers' readiness in applying ICT in their teaching and learning. Apart from that, this study was carried out to differentiate the influence of exogenous variables from the endogenous variables based on the academic fields (pure science and social science). This is a quantitative study using a survey method, involving a total of 874 high school teachers in Indonesia, including 446 science teachers and 428 social science teachers. Data was analyzed using path analysis (path analysis/ SEM) with AMOS software version 18. The results show that motivation is a significant variable as a mediator between the variables of readiness with ICT application in teaching and learning science and social science. Analysis of structural equation path model (SEM) shows that the data used in this study has a reasonable suitability for the proposed regression model. Thus, it is proved that the two independent variables are linked directly and indirectly to the dependent variable of the study which is the application of ICT in teaching and learning. The implication of this study is that the governments and ministry of educations take into account teachers attitudes and motivations in terms of ICT application and address this issue by providing sufficient infrastructure, equipments, facilities, and training for teachers to develop positive attitudes towards ICT use in education.

KEYWORDS: Motivation, Readiness, Mediator, Application, SEM Analysis

INTRODUCTION

The world is experiencing rapid changes which cause the explosion of ever-changing technologies. These changes are happening all over the globe, including developing countries like Indonesia. Therefore, it is inevitable that these changes should be embraced realistically so the developing countries are not to be left behind in improving the quality of education as well as strengthening the implementation of classroom instructional process. The presence of various new means of information has changed the state of thoughts, ideologies and cultures. Apart from that, the world is now borderless; hence, various external elements are invading other countries without border controls. As such, this development of information technology is synonymous with the universal theme as the world without boundaries, which as Davis (2001) stated that one of human tendencies in the early 21st century is the information revolution. This means that information is obtained more rapidly, which put conventional methods, such as going to the library and printed materials are so out of styles.

Now, the education system has fully realised the potential of ICT as a valueable assisting tool in teaching and learning (Drier, 2001). Students are now more interested in using ICT to access information, having personal websites is a current trend where they can easily check their status via social networkings such as myspace, friendster, blogspot, facebook and the list goes on. This phenomenon has become a trend among school students (Youssef et al., 2013; Zhao, et.al, 2002). This new type of students' interests and hobbies should be taken advantaged by teachers and parents to guide the students on the correct use of ICT (Badri et al., 2013). However, the most significant challenges faced by teachers are in handling a paradigm shift towards the ever-changing methods of teaching and learning and how to use computers and ICT as an alternative approach.

According to Baharuddin et al, (2000), for over the last thirty years, most classrooms in the European Countries have integrated ICT in the instructional process by learning how to use technology and ICT competencies also known as ICT literacy, which involve knowledge about the basic concept and operation, computer usage, word processing, spreadsheet, database, file management, documentation, presentation and communication of information. Technology can make our lives easier and everyday tasks are simplified (Brooke, 2013; Holmes, 1999). In the context of teaching and learning, technology can facilitate tasks and improve teachers' performance in creating effective teaching and learning activities. According to Pisapa (1994), the integration of ICT in the instructional process refers to the use of learning technologies to promote, strengthen and enhance skills. Information technology should be used in combination with other teaching methods. Teachers need to integrate ICT to add value to the teaching and learning activities (R & D).

In the Indonesian context, ICT was first developed in 1983 at the University of Indonesia, in the form of University Network (UINet) by Dr. Joseph F.P Luhukay, who at the moment had just completed the Computer Knowledge doctorate program in the United States. The network was developed for over four years. In the same year, Luhukay initiated the establishment of the UINet at the Department of Culture and Education which was a computer network covering a wider reach of the University of Indonesia, Bandung Institute of Technology, Bogor Institute of Agriculture, Gadjah Mada University, Surabaya Institute of Technology and Hasanudin University (Sutedjo, 2002). However, ICT is generally still an exclusive matter for the Indonesian people (Onno, 2003). Internet service in Indonesia is still a cost center and not yet a profit center. This is due to the significant facts of the minimum number of phones available, the uneven distribution of accessible networks (fiber optic cable), and the rental of internet line is still very expensive. In addition, Internet users in Indonesia are mostly among the upper middle social class and consumption patterns are more for educational purposes.

Naidu et al. (2006) stated that attitudes are beliefs, emotional reactions and behavioral tendencies toward an object that induce or inhibit a person to make a choice of action in an activity that is academic or informal. Skills could be considered as the ability or capacity to do something well. According to Wong (2002), information and communication technology skills can be viewed in two dimensions of ICT content skills and the skills of using ICT to complete tasks. ICT is a new mean of technology to access information through an interactive spreadsheet that is more attractive through the integration of audio-visual and multimedia. Hubona and Whisenand (1995) viewed the use of ICT as a combination of traditional computer application and modern communication tools involving electronic mail and websites through communication networks and great access to information through search engines (Google and Mozilla).

Correspondingly, Albirini (2006) highlights the importance of teacher's vision of technology itself, his/her experiences with it, as well as the cultural conditions under which ICT is introduced into schools in shaping teacher's attitudes toward technology and its subsequent diffusion in his/her educational practice.

PROBLEM STATEMENT

Indonesia is still lagging in terms of ICT provision as the usage in Indonesia is still limited and only available in the state of Java, and sadly the areas outside of Java are experiencing limited internet access. Prayitno (2007) stated that the use of internet as a whole is still relatively new to the Indonesian people and the number of users is still slightly lower than the total population and its accessibility is only in the big cities.

Siti Aishah et al. (2002) and Robiah et al. (2003) have found that teachers are comfortable with the conventional aids compared to the use of ICT. Their willingness to improve their knowledge and ICT skills is also very low, with their nonchalant attitude and disregard ICT as an urgent need to improve the quality and standards of their teaching and learning. The majority of teachers do not have good computer skills, which in this context referred to the basic knowledge of using Microsoft Word, Microsoft Excel and Microsoft PowerPoint. This is a clear evident that teachers do need helps. Apart from that, their skills in handling Microsoft Access and multimedia softwares such as Paint and Photoshop are still limited and their ability to use multimedia equipments such as scanners, digital cameras and digital video is very low. Teachers are also weak in electronic communications such as e-mail, chat, and exploring information from CD-ROMs and internet (Abdullah bin Md Yatim, 2002).

The common problem faced by the teachers is the lack of knowledge on how to use the internet to search and identify certain information. This dissuades them to apply it in their teaching and learning (Yunus & Wekke, 2009). They are disheartened with fear that their weaknesses will be known by students. This is consistent with a study by Laurillard (1994) which found that teachers were not competent in the use of technology, especially computers because of a lack of knowledge. For example they took a long time searching for information via the internet; some were unable to search because they did not have the knowledge of internet search (Rye, 2009).

This study was designed to examine the readiness and self-motivation of high schools teachers in Indonesia in the use of ICT and ICT applications in teaching and learning in order to create a meaningful learning experience for students and to improve teaching effectiveness. This study also identified factors which work as mediators on teachers' willingness to apply ICT in their teaching and learning and to support the optimal use of ICT in teaching and learning activities.

LITERATURE REVIEW

ICT motivation

Motivation includes several factors which drive the selection, the persistence, as well as the engagement in particular activities to achieve an objective (Dweck & Elliott 1983). Besides, motivation is referred to the process in which goal-directed behaviour is prompted and sustained (Schunk 1990). Therefore, motivational factors are

regarded to be part of a person's goal structures and beliefs regarding what is significant (Ames 1992). accordingly, teachers' sufficient levels of motivation are seen to be associated with the innovative role of technology. Likewise, empirical study has effectively linked motivation to teacher's computer use (Sang et al., 2010)

Teacher readiness

Teachers are considered as the main factor that generally determines educational development and innovation since they are the ones to employ the ICT investments for the purpose of educational development. It is argued that Technology has no an educational value in itself (Sang et al., 2010). However, their importance is highly recognized when being used by teachers in the process of teaching and learning.

While some people claim that the presence of technology in the classroom produces a pressure and requires efficient and effective use (Sang et al., 2011), study results display that these are also connected to teachers' attitudes and their levels of knowledge (Badri et al., 2013; Tezci, 2010). Teachers' positive views towards the applications of ICT or rejecting them all together are affected by their attitudes, (Albirini, 2006) as well as other significant factors such as their information about and experience with ICT (Badri et al., 2013) their experiences in how to utilize these technologies in classroom environment (Keramati, 2011), information and experiences regarding the kinds of applications based on ICT, age, self-confidence (Molnár & Benedek 2013; Reading & Doyle, 2013).

The main issue in teachers' decision to utilize or not to use ICT is related to their attitudes. The results of a study by Badri et al. (2013) show that an individual's attitudes have a significant impact on his/her behaviors in ICT use. Teachers' attitudes (positive or negative) influence how they respond to and employ ICT. Therefore, information is needed about teachers' attitudes for planning about and future investment in ICT (Tezci, 2010). Likewise, Keramati et al. (2011) found that teacher's motivation and training play a substantial role in ICT application in education.

Sang et al. 2011 has emphasized the strong relationships between computer-related attitudes and computer application in education. Attitudes towards computers affect teachers' acceptance of the usefulness of technology, and also affect whether teachers will integrate ICT into their classrooms.

Thus, Teachers' positive attitude can facilitate their use of more instructional technology tools in order to make learning more interesting as well as attractive for their students. However, Teachers who have negative attitudes towards technology application in education cannot benefit in this area nor efficiently integrate technology into the education system.

In Indonesia, as a developing country, the use of ICT in education by teachers is far from sufficient (Rye, 2009; Yunus & Wekke, 2009). However, very few studies have been reported in this area. Therefore, given the importance of teachers' attitudes and motivation in the application of ICT in education the relationship between motivation and ICT readiness needs to be investigated.

OBJECTIVES OF THE STUDY

The primary objective of this study was to identify self-motivation as a mediator on teachers' willingness to apply ICT in their teaching and learning. The other objective was to determine the influence of the independent variables (exogenous) on the dependent variables (endogenous) based on the academic fields (pure science and social science teachers).

MATERIALS AND METHODS

Instrument

This is a quantitative study using a survey method.

Population and sample group

The study sample was selected using purposive sampling and simple random techniques. A total of 874 high school teachers, including 446 science teachers and 428 social science teachers comprise the study sample.

Data analysis

Data was analyzed using path analysis (path analysis/ SEM) with AMOS software version 18.

Study procedure

The survey method was used to collect data by using questionnaires. A pilot study was conducted involving a total of 200 secondary school teachers for the purpose of determining the validity and reliability of the research instrument. The Cronbach's alpha value for each aspect is as follow: teachers' attitudes towards ICT (0815), the use of ICT (0923), ICT facilities in schools (0888), ICT knowledge (0968), ICT skills (0.970) and the application of ICT in teaching and learning (0943). Every aspect has high reliability and fit to be used in the actual study for all of the instruments for readiness, motivation and application of ICT in teaching and learning. Respondents for the actual study were teachers from secondary schools in Indonesia. A total of 874 teachers were selected using purposive sampling and simple random techniques. Data was analysed by using Structural Equation Model (SEM) with AMOS 18.0 software to test the research hypotheses.

Results

Analysis of Structural Equation Model (SEM) with AMOS 18.0 software was used to test motivation as a mediator for teachers' readiness towards the application of ICT in teaching and learning. The results of the SEM analysis are as shown in Figure 1 below.

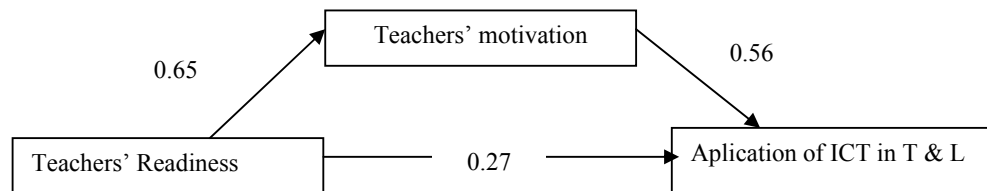


Figure 1: Motivation as a Mediator for Teachers' Readiness towards the Application of ICT in Teaching and Learning

SEM analysis of AMOS 18 software shows that teachers' motivation is a mediator towards teachers' readiness to apply ICT in teaching and learning. The results of the path analysis SEM equations model indicate SEM measurements as the following: Chi Square / df = 0.000, Root Mean Square Error Approximation (RMSEA) = 0.07, Goodness of Fit Index (GFI) = 1.000 and comparative fit index (CFI) = 1.000. All of the measures used show that the data used in this study proved to have reasonable compatibility with the model.

Table1 Goodness of Fit Index (GFI) of the Respondents

| Parameter | Coefficient /Index | |
|--------------------|--------------------|-------|
| GFI | >0.9 | 1.000 |
| NFI | >0.9 | 1.000 |
| RMSEA | <0.08 | 0.069 |
| CFI | >0.9 | 1.000 |
| X ² /df | <0.3 | 0.000 |

Path analysis of the structural equation model (SEM) showed that the regression model proposed is compatible, where teachers' motivation is a significant predictor for the variable of readiness (motivation $\beta = 0.65$, $p < 0.000$). Results of the analysis also indicate that variables in term of teachers' readiness and motivation are significant predictors for other variable which is the application of ICT in teaching and learning (readiness $\beta = 0.56$, $p = 0.000$; motivation $\beta = 0.27$, $p < 0.000$).

In overall, the results of path analysis structural equation model (SEM) showed the variance in the endogenous variables, the application of ICT in teaching and learning as predicted by exogenous variables is 0.59. This shows that 59% of the variances of the application of ICT in teaching and learning is predicted by all the independent variables of the study. Thus, this means there is 0.41 or 41% of the variances in the variable of ICT application in teaching and learning can not be predicted by the regression model. Sobel test results show the impact value of motivation as a mediator for teachers readiness in applying ICT in their teaching and learning with the value of $z = 19.576$ and $\text{sig} = 0.000$ ($p < 0.05$). This shows that motivation is a significant factor which plays as a mediator for the teachers to be ready in applying ICT in their teaching and learning process.

A model was designed and analyzed by using AMOS 18 to show a detailed look of the contribution of each aspect in teachers' motivation as mediator for teachers' readiness in applying ICT in their teaching and learning. The result is shown as in Figure 3 below.

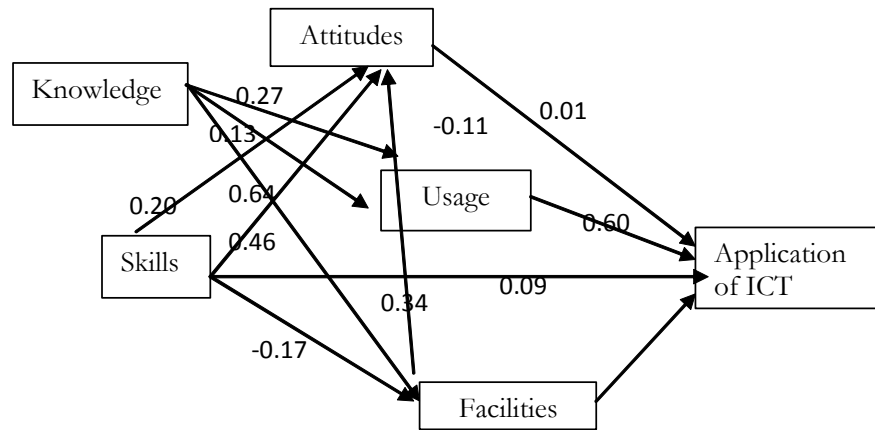


Figure 2 the aspects of motivation as mediator to each aspect of readiness towards the application of ICT in Teaching and Learning

SEM analysis of AMOS 18 software shows that the usage of ICT and ICT facilities are mediators for teachers in terms of ICT knowledge and ICT skills in the application of ICT in teaching and learning. Path analysis of the SEM equations model shows results that indicate the following: measurement of the Chi Square / df = 301 345, Root Mean Square Error Approximation (RMSEA) = 0.059, Goodness of Fit Index (GFI) = 0.972 and comparative fit index (CFI) = 0.906. All of the measures used show that the data used in this study proved to have reasonable suitability for the proposed model.

Table 2 Goodness of Fit Index (GFI) of the respondents

| Parameter | Coefficient /Index | |
|--------------------|--------------------|-------|
| GFI | >0.9 | 0.972 |
| NFI | >0.9 | 0.906 |
| RMSEA | <0.08 | 0.059 |
| CFI | >0.9 | 0.906 |
| X ² /df | <0.3 | 0.000 |

The results of structural equation model (SEM) path analysis showed that the regression model is compatible as proposed, where ICT knowledge and ICT skills are significant predictor variables for the attitude variable (knowledge, $\beta = 0.13$, $p < 0.000$; skills, $\beta = 0.20$, $p = 0.000$). The analysis also shows ICT knowledge and ICT skills of the teachers are significant predictor variables for the following variables: the use of ICT (knowledge, $\beta = 0.27$, $p < 0.000$; skills, $\beta = 0.246$, $p = 0.000$) and ICT knowledge and ICT skills are significant predictor variables for the variable of ICT facilities (knowledge, $\beta = 0.64$, $p = 0.000$; skills, $\beta = -0.17$, $p = 0.000$).

The analysis shows that the variables of ICT knowledge and ICT skills are significant predictor variables for the variables of ICT application in teaching and learning (knowledge $\beta = -0.11$, $p < 0.000$; encouragement $\beta = 0.34$, $p < 0.000$). As a result, this shows that the use of ICT is a significant mediator for the teachers to apply ICT in their teaching and learning (use $\beta = 0.60$, $p < 0.000$). However, the attitude and ICT facilities are not mediators for the application of ICT (ICT attitude $\beta = 0.01$ and $p > 0.001$; facility $\beta = 0.09$, $p < 0.001$).

Sobel test results to see the impact of every aspect of motivation as a mediator in the aspect of teachers support towards ICT applications can be seen in Table 3 below.

Table 3 Sobel test on the effect of Motivation as mediator for teachers' readiness in applying ICT in teaching and learning

| Mediated pathway | Z | P |
|--|-------|------|
| Knowledge → Attitude → ICT Application | 8.42 | 0.00 |
| Skills → Attitude → ICT application | 11.28 | 0.00 |
| Knowledge → Usage → ICT application | 19.04 | 0.00 |
| Skills → Usage → ICT application | 20.18 | 0.00 |
| Knowledge → Facilities → ICT application | 11.99 | 0.00 |
| Skills → Facilities → ICT application | 9.85 | 0.00 |

Table 3 shows that attitude, usage and facilities are significant mediators for knowledge and skills in the application of ICT ($p < 0.05$). This clearly shows that the elements of teachers' motivation which consists of attitude, usage and facilities, effectively react as mediators for the teachers to be ready. In this context, readiness involves knowledge and skills to apply ICT in teaching and learning.

DISCUSSION

The results showed that motivation is a mediator that help teachers to be ready in applying ICT in their teaching and learning. These findings reaffirm a study by Abdul Wahab (2006) that there is a significant relationship between knowledge, skills and the usage of information and communication technology with the attitude towards information and communication technology. The study result is also consistent with the finding of a study by Aldunate and Nussbaum (2013) as they report that teachers who do not employ technology early in their teaching process and devote a small portion of their time to incorporating educational technology are less likely to adopt new technology.

Attitude is seen as a catalyst in determining whether teachers are willing to use ICT or otherwise. Normally, it is common for teachers to be positive in adapting with changes and accepting new technologies. Hence, their professional attitudes will help them in utilising the technologies as a way to improve the quality of their teaching and learning (Tezci, 2010).

Teachers are professionals who constantly experience changes and face development of new technologies in their lives. As professionals, they understand their roles and functions as a resource and catalyst for learning activities. According to Norton & Willburg (2003), teachers are always keen to have new technologies in the hope that technologies can help them in overcoming problems encountered in the context of teaching and learning. However, there are still teachers who do not realize the importance of ICT and multimedia as teaching and learning aids. Thus, according to Norhayati Abd Mukti (1995), teachers are still not fully ready to use computers in their teaching and learning and such rely more on their usual ways of teaching which normally oral presentations and question and answer with the least emphasis on ICT development.

There are also teachers who do not fully utilize the advantages and capabilities of ICT in their schools, even if the government has supplied complete equipments and ICT facilities (Lim & Pannen, 2012). This occurs due to a number of factors that discourage the teachers. Teachers are actually facing great challenges and problems in the use of ICT in their teaching and learning, especially their negative attitude towards the use of ICT and their lack of the knowledge and skills in using ICT for teaching and learning process. This statement reinforces the study by Newby et al. (2000) which found that technical teachers do not use ICT in their teaching, even though they are given adequate facilities.

Face-to-face teaching is still relevant and seems a common practised. However, it is an added value if teachers are able to integrate ICT in their lesson. This in fact will enhance effectiveness in which teachers are still the most important players, as they are the ones who should know how to integrate ICT in the curriculum content (Konstantinos, Andreas, & Karakiza, 2013; Tezci, 2010). The lesson should be presented in such a way that learning would be fun, more attractive and effective through information management and integration with pedagogical competency and practice methodology. However, Dlodlo (2009) argues that information technology alone will not change anything without great operators and drivers, which in this context refer to the teachers (Badri et al., 2013).

Teachers who regularly use the technologies will have extensive knowledge not only about the content of the subject but also on information and communication technology. Teaching with information and communication technology (ICT) such as the use of blogs, videos, websites, e-mail, etc. will reflect the maturity level of the educators, and level up students' appreciation as teachers are viewed as visionary, advanced and up to date (Sang et al., 2011; Owen et al., 2000).

Teachers' competencies and their knowledge on how to access information via the Internet is also supported by the way they explore the applications through search engines. Lacking of appropriate skills and knowledge, will discourage teachers to use ICT and this will overtime cause desperate fall. Teachers need to get familiar with computers and keep on searching for information via the Internet multi resources. In the long run, they will naturally adapt with the latest technological developments through a variety of devices and networks. Siti Fatimah et al (2005) argues that learning to apply ICT for data presentation such as a power point presentation, Prezi and graphics editor would be a form of improvements, as information is delivered in a more attractive and impressive manner.

CONTRIBUTION OF THE STUDY

The primary finding of this study is that teachers' motivation is a mediator on their willingness to apply ICT in their teaching and learning. The study found that teachers' motivation is the most important factor in ICT readiness and there is a positive correlation between selfmotivation and ICT readiness. In general, the result of the study can be used for developing and popularizing ICT usage at both school and higher education levels across disciplines. Findings of this study will be valuable for both academics and practitioners of ICT in education.

As technology readiness and adaptation process is positively correlated with the type of teacher's attitude and motivation towards new technology, hence preparing and training teachers in this vein to embrace technology is paramount importance which needs to be taken into account by stakeholders.

Furthermore, since the technology adoption process appears to be qualitatively different for different technologies, in terms of complexity of application, hence, the stakeholders and those in charge of ICT use in education need to take this issue into consideration.

As some related studies have been conducted in the other countries and have come up with almost similar results locally, for example, Iran (Keramati et al. 2011), the Emirats (Badri et al., 2013), and Greece (Konstantinos et al., 2013), it can be concluded that the issue is prevailing in developing countries.

The solution for this issue is that the developing countries which have the sufficient infrastructure and facilities to integrate ICT into the education system and curriculum should take efforts to facilitate the introduction of ICT into the education system. To this end, they need to train and educate the teacher to be familiar with the benefits of ICT as well as learn how to employ it in the process of teaching and learning.

Furthermore, since teachers' attitudes and motivation play a key role in the willingness and readiness for ICT application, governments need to address this issue by facilitating the transition from traditional system of education to the modern system where ICT has a leading part in education. More specifically, in addition to establishing the infrastructure and providing the necessary equipments, the governments should provide sufficient training for teachers.

Thus, In addition to adding to the body of knowledge, this study lays the ground for longitudinal study to delve into this area and unveil the issues and barriers of ICT usage in developing countries, since the issue of ICT readiness and adoption is a challenge specifically prevailing in the developing countries.

IMPLICATION, SUGGESTION AND CONCLUSION

To effectively integrate technology into education government should provide facilities to train teachers and advocate for technology's advantage to the teachers and students alike, and accordingly develop a positive attitude toward technology in the schools' teaching practices. In addition, feedback needs to be collected for the purpose of integrating technology continuously.

Furthermore, the major problem is teacher's conception of ICT since teacher's attitude toward ICT is not appropriate. Therefore, it is important to first convince managers and second train teachers and elucidate benefits of this new paradigm for teachers.

As this study has demonstrated that teachers' motivation is a mediator on their willingness to apply ICT in their teaching and learning, this is very much associated with knowledge, so, teachers must be able to apply the knowledge to use ICT with their own information technology skills. Frequent use of the applications will in fact improve the skills and capability, which in the long run increase the application of ICT in teaching and learning. Sustainable efforts are required to improve the skills of using ICT. Therefore, the Ministry of Education needs to encourage all teachers especially by providing sufficient trainings and facilities for them to use ICT. Hence, such experiences can lead to more comfort, confidence, acceptance, and eventually development a positive attitude toward ICT integration into curricula and teaching.

REFERENCES

- Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Computers & Education*, 47(4), 373-398.
- Aldunate, R., & Nussbaum, M. (2013). Teacher adoption of technology. *Computers in Human Behavior*, 29(3), 519-524.

- Abdullah bin Md Yatim, 2002. Perkembangan Internet dan Implikasi terhadap Suasana Pengajaran Sekolah: Maktab Perguruan Temenggong Ibrahim, Jurnal Pendidikan. Guru Bil. 12/1999. Johor Bahru, Johor.
- Abdul Wahab Ismail Gani, Kamaliah Hj. Siarap & Hasrina Mustafa. 2006. Penggunaan komputer dalam pengajaran-pembelajaran dalam kalangan guru sekolah menengah: satu kajian kes di pulau pinang. *Kajian Malaysia*, Vol. XXIV, No 1&2.
- Ames C. (1992) Classrooms: goals, structures, and student motivation. *Journal of Educational Psychology* 84, 261–271.
- Badri, M., Al Rashedi, A., & Mohaidat, J. (2013, March). School teachers' technology readiness–An empirical study applying readiness factors and teacher type categorization. In *Proceedings of the 2013 International Conference on Information, Business and Education Technology (ICIBET 2013)*. Atlantis Press.
- Baharuddin Aris, Rio Sumarni Sharifuddin, Manimegalai Subramaniam, 2002. Reka Bentuk Perisian Multimedia. Edisi pertama. Johor. Universiti Teknologi Malaysia.
- Davis, N. 2001. The virtual community of teachers: isu in teaching using ICT. *Hlm. 31-48*. London: Routledge Palmer.
- Dawes L. (2001) what stops teachers using new technology? In *Issues in Teaching Using ICT* (ed. M. Leask), pp. 61–79. Routledge, London.
- Dlodlo, N. 2009. Access to ICT education for girls and women in rural South Africa: A case study. *Technology in Society*, 31 (2009) 168-175. Retrieved February 10, 2010, from Science Direct database.
- Drier, H.S. 2001. Teaching and learning mathematics with interactive spreadsheets. *School Science and mathematics*, 101 (4): 170-179
- Georgsen, M and Pär-Ola Zander, P.O (2013). *Changing Education through ICT In Developing Countries*. Aalborg University Press.
- Holmes, W. 1999. The transforming power of information technology. *Community college journal*. 70 (2). M/s 10-15
- Hubona, G.S & Whisenand, T.G, 1995. External variables and the technology acceptance model. Kertas kerja dibentangkan di *Associations for information system American conference*, Pittsburg, PA, 18 January, 2000.
- Keramati, A., Afshari-Mofrad, M. and Kamrani, A. (2011) 'The role of readiness Factors in E-Learning outcomes: An empirical study', *Computers & Education*, Vol. 57, pp.1919-1929.
- Konstantinos, T., Andreas, A., & Karakiza, T. (2013). Views of ict teachers about the Introduction of ict in primary education in GREECE. *Turkish Online Journal of Educational Technology*, 12(1).
- Laurillard, D. M. 1994. How Can Learning Technologies Improve Learning?. *Law Technology Journal* 3(1), 46–49.
- Lim, C. P., & Pannen, P. (2012). Building the capacity of Indonesian education universities for ICT in pre-service teacher education: A case study of a strategic planning exercise. *Australasian Journal of Educational Technology*, 28(6), 1061-1067.
- Molnár, G., & Benedek, A. (2013, July). ICT Related Tasks and Challenges in the New Model of Technical Teacher Training. In *ICCGI 2013, The Eighth International Multi-Conference on Computing in the Global Information Technology* (pp. 40-44).
- Naidu, S & Jasen, C, 2006. Meta survey on the use of technologies in education: Australia (hal.149-156). Retrieved from http://www.unescobkk.org/fileadmin/user_upload/ict/Metasurvey/australia.pdf
- Newby, T.J, Stepich, D.A, Lehmann, J.D & Russel, J.D, 2000. *Instructional technology for teaching and learning. Designing instruction, integrating computers and using media*. New Jersey: Merrill and Prentice Hall.
- Norhayati Abd Mukti, 1995. *Factors related to teacher use of computer technology in Malaysia*. Doctoral Dissertation: Michigan State University.
- Norton, P & Willburg, K.M. 2003. *Teaching with technology*. Edisi ke 2. Belmont: Wadsworth Publishing.
- Onno, W.P, 2003. *Falsafah kehidupan dunia cyber*. Jakarta: Penerbit Republika
- Owen, M.B, Mustian, R.D & Liles, R.T. 2000. Integrating ICT into education systems: A criterion based framework for decision making. *Priceedings of the international conference on education and ICT in the New Millenium*, 15-27.
- Pisapa, L. 1994. *Integrating technology into teaching and learning*. Singapore: Prentice Hall.
- Prayitno, W. 2007. *Aplikasi media teknologi dalam komunikasi pendidikan*. Jakarta: JayaBersa.
- Reading, C., & Doyle, H. (2013). Teacher educators as learners: Enabling learning while developing innovative practice in ICT-rich education. *Australian Educational Computing, Special Edition: Teaching Teachers for the Future Project*, 27, 109-116.
- Robiah Sidin, Juhana Salim & Nor Sakinah Mohamad, 2003. *Pembudayaan teknologi maklumat dan komunikasi dalam kalangan pelajar Melayu pada arus globalisasi*. Laporan akhir penyelidikan arus perdana II: UKM
- Rye, S. A. (2009). Negotiating the symbolic power of information and communication Technologies (ICT): The spread of Internet-supported distance Education. *Information Technology for Development*, 15(1), 17-31.

- Sang, G., Valcke, M., van Braak, J., Tondeur, J., & Zhu, C. (2011). Predicting ICT integration into classroom teaching in Chinese primary schools: exploring the complex interplay of teacher-related variables. *Journal of Computer Assisted Learning*, 27(2), 160-172.
- Schunk D.H. (1990) Goal setting and self-efficacy during self regulated Learning. *Educational Psychologist* 25, 71-86.
- Siti Aishah, Noraidah Sahari & Hazura Mohamad, 2002. Kajian perbandingan kesedaran, knowledge dan penggunaan ICT dalam kalangan guru-guru sekolah di bandar dan luar bandar, *prosiding seminar kebangsaan profesion perguruan*, 1: 150-158.
- Siti Fatimah Mohd Yassin, Baharuddin Aris & Abdul Hafidz Omar, 2005. Pembelajaran berasaskan projek pembangunan produk multimedia kreatif untuk pengembangan kreativiti pelajar luar bandar di kelas Literasi Komputer. *Prosiding Konvensyen Teknologi Pendidikan*, 18: 608-614
- Sutedjo, 2002. E-Pendidikan, konsep teknologi dan aplikasi internet, Pendidikan Edisi II. Bandung: Bina Karya.
- Tezci, E. (2010). Attitudes and knowledge level of teachers in ICT use: The case of Turkish teachers. *International Journal of Human Sciences*, 7(2).
- Wong Su Luan, 2002. Development and validation of an information technology (IT) based instrument to measure teachers IT preparedness. Tesis Doktor Falsafah, UniPutra.
- Yunus, M. M., & Wekke, I. S. (2009). The application of multicultural education and applying ICT on Pesantren in South Sulawesi, Indonesia.
- Zhao, Y, Pugh. K, Sheldon. S & Byers. J.L, 2002. Conditions for classroom technology innovation. *Teachers College Record*, 104 (3): 482-515.